

REMARKS

Favorable reconsideration of the application is respectfully requested in light of the amendments and remarks herein.

Upon entry of this amendment, claims 1-10 will be pending. By this amendment, claims 1 and 6 have been amended. No new matter has been added.

Objections to the Specification

Title of the Specification has been objected to in Section 3 of the Office Action. The title has been amended, thereby obviating the objection. Accordingly, it is respectfully requested that this objection be withdrawn.

Objections to Claims 1 and 6

Claims 1 and 6 have been objected to in Section 4 of the Office Action because of informalities. Relevant claims 1 and 6 have been amended, obviating this objection. Accordingly, it is respectfully requested that this objection be withdrawn.

§103 Rejection of Claims 1-4 and 6-9

In Section 7 of the Office Action, claims 1-4 and 6-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Taura (U.S. Patent No. 6,642,957) in view of Yamada (U.S. Patent No. 6,573,935), further in view of Van Rooy (U.S. Patent No. 6,657,659).

In the Background section of the Specification, it was disclosed that “since the photosensors for pixels in the CCD are different in sensitivity from each other, there will exist a difference in amplitude between a G signal from a G pixel included in a horizontal line of R, G,

R, G, ..., R and G color filters and a G signal from a G pixel included in a horizontal line of G, B, G, B, ..., G and B color filters. Therefore, in a single-chip color imaging apparatus, when a luminance signal is produced from color signals from pixels in each horizontal line, the above difference in sensitivity from one photosensor to the other will cause a difference in amplitude between luminance signals from the pixels in different horizontal lines and it will appear as a horizontal stripe-like noise in a monitoring image and captured image.” *Background of the Specification, page 2, line 13 – page 3, line 1.*

Thus, the above paragraph of the Background highlights the problem associated with difference in sensitivity from one photosensor to another that will cause a difference in amplitude between luminance signals from the pixels in different horizontal lines.

To solve this problem, embodiments of the present invention provide a color imaging apparatus including a gain controlling means for controlling the amplitude difference between the luminance signals. For example, the structure of apparatus claim 1, as presented herein, includes:

“a solid-state image sensor having photosensors color-coded with three primary color filters formed like a matrix correspondingly to pixels of the solid-state image sensor, to provide three primary color signals acquired as captured image signals;

a four-channel signal detecting means for detecting, from the three primary color signals provided from the solid-state image sensor, an R signal acquired from R pixels in a horizontal line of R, G, R, G, ..., R and G color filters, a Gr signal acquired from the G pixels in the same horizontal line, a Gb signal acquired from G pixels in a horizontal line of G, B, G, B, ..., G and B color filters, and a B signal acquired from the B pixels in the same horizontal line;

a four-channel variable-gain amplifying means whose channels are controllable in gain independently of one another to amplify the R, Gr, Gb and B signals; and

a gain controlling means for controlling, based on an output from the signal detecting means, the gains of R and B channels of the variable-gain

amplifying means so that the R and B signals amplified by the variable-gain amplifying means are equal in level for an achromatic color image, and said gain controlling means controlling the gains of Gr and Gb channels of the variable-gain amplifying means so that the amplitude difference between the luminance signal for the horizontal line of R, G, R, G, ..., R and G color filters produced from the R and Gr signal and the luminance signal for the horizontal line of G, B, G, B, ..., G and B color filters produced from the B and Gb signal is substantially reduced.”

(emphasis added)

In summary, the color imaging apparatus of claim 1 includes a four-channel variable-gain amplifying means controllable in gain independently of one another to amplify the R, Gr, Gb and B signals; and a gain controlling means for controlling the gains of R and B channels of the variable-gain amplifying means, and for controlling the gains of Gr and Gb channels of the variable-gain amplifying means so that the *amplitude difference* between the luminance signal produced from the R and Gr signal and the luminance signal produced from the B and Gb signal *is substantially reduced*.

It was indicated in the Office Action that Taura fails to teach a four channel detecting means and a four channel variable-gain amplifying means.

Although Yamada discloses having horizontal lines of R,G,R,G and G,B,G,B patterns, Yamada fails to teach or suggest using the four channel detecting means and the four channel variable-gain amplifying means to independently control the gains of each of the four R, Gr, Gb and B signals. Instead Yamada suggests that “[i]t is possible to adjust the sensitivities of photoelectric conversion elements of respective colors, e.g., R, G and B by controlling a relation between charge storage times (integration times) of R, G and B elements.” *Yamada, column 3, lines 31-34*. Further, Yamada states that “[f]ixed pattern noises caused by a difference amount of crosstalk to be caused by different color filter layouts can be reduced by adjusting the charge storage times of different groups of photoelectric conversion element of a certain color.”

Yamada, column 3, lines 58-62. Therefore, Yamada seems to suggest adjusting the integration time of each of the photodetectors R, G, and B to reduce the crosstalk rather than detecting the four signals R, Gr, Gb, and B using the four channel signal detecting means, and adjusting the variable gains of the four channel amplifying means for the four signals.

Although it is indicated that Van Rooy discloses “separate corrections for red, green and blue are necessary, either by separately controlling the gain or by separately controlling exposure time of the sensors, Van Rooy fails to teach or suggest a color imaging apparatus including a four-channel variable-gain amplifying means controllable in gain independently of one another to amplify the R, Gr, Gb and B signals; and a gain controlling means for controlling the gains of R and B channels of the variable-gain amplifying means, and for controlling the gains of Gr and Gb channels of the variable-gain amplifying means so that the *amplitude difference* between the luminance signal produced from the R and Gr signal and the luminance signal produced from the B and Gb signal *is substantially reduced*.

Therefore, it is maintained that Taura, Yamada, and Van Rooy, individually or in combination, fail to teach or suggest a color imaging apparatus including a four-channel variable-gain amplifying means controllable in gain independently of one another to amplify the R, Gr, Gb and B signals; and a gain controlling means for controlling the gains of R and B channels of the variable-gain amplifying means, and for controlling the gains of Gr and Gb channels of the variable-gain amplifying means so that the *amplitude difference* between the luminance signal produced from the R and Gr signal and the luminance signal produced from the B and Gb signal *is substantially reduced*.

Based on the foregoing discussion, it is maintained that claim 1 should be allowable over the combination of Taura, Yamada, and Van Rooy. Since independent claim 6 closely parallels,

and includes substantially similar limitations as, independent claim 1, claim 6 should also be allowable over the combination of Taura, Yamada, and Van Rooy. Further, since claims 2-4 and 7-9 depend from claims 1 and 6, respectively, claims 2-4 and 7-9 should also be allowable over the combination of Taura, Yamada, and Van Rooy.

Accordingly, it is submitted that the Examiner's rejection of claims 1-4 and 6-9 based upon 35 U.S.C. §103(a) has been overcome by the present remarks and withdrawal thereof is respectfully requested.

§103 Rejection of Claims 5 and 10

In Section 8 of the Office Action, the Examiner has rejected claims 5 and 10 under 35 U.S.C. §103(a) as being unpatentable over Taura in view of Yamada, further in view of Van Rooy, and further in view of Kim (U.S. Patent No. 6,597,935).

Based on the foregoing discussion regarding claims 1 and 6, and since claims 5 and 10 depend from claims 1 and 6, respectively, claims 5 and 10 should be allowable over the combination of Taura, Yamada, and Van Rooy.

Kim is indicated as teaching sampling and holding, AGC, and A/D conversion in that order, it is maintained that Kim fails to teach or suggest a color imaging apparatus including a four-channel variable-gain amplifying means controllable in gain independently of one another to amplify the R, Gr, Gb and B signals; and a gain controlling means for controlling the gains of R and B channels of the variable-gain amplifying means, and for controlling the gains of Gr and Gb channels of the variable-gain amplifying means so that the *amplitude difference* between the luminance signal produced from the R and Gr signal and the luminance signal produced from the B and Gb signal *is substantially reduced*.

Accordingly, it is submitted that the Examiner's rejection of claims 5 and 10 based upon 35 U.S.C. §103(a) has been overcome by the present remarks and withdrawal thereof is respectfully requested.

Conclusion

In view of the foregoing, entry of this amendment, and the allowance of this application with claims 1-10 are respectfully solicited.

In regard to the claims amended herein and throughout the prosecution of this application, it is submitted that these claims, as originally presented, are patentably distinct over the prior art of record, and that these claims were in full compliance with the requirements of 35 U.S.C. §112. Changes that have been made to these claims were not made for the purpose of patentability within the meaning of 35 U.S.C. §§101, 102, 103 or 112. Rather, these changes were made simply for clarification and to round out the scope of protection to which Applicant is entitled.

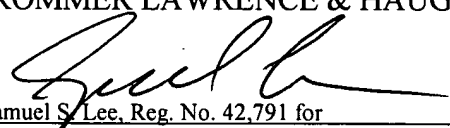
In the event that additional cooperation in this case may be helpful to complete its prosecution, the Examiner is cordially invited to contact Applicant's representative at the telephone number written below.

The Commissioner is hereby authorized to charge any insufficient fees or credit any overpayment associated with the above-identified application to Deposit Account 50-0320.

Respectfully submitted,

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